APPENDIX D

DRILLING MUD MATERIALS

Drilling mud materials identified as toxic or hazardous are to be handled, stored and transported per Chapter 173-303 WAC. [W4, WI8]

FUNCTION	MATERIALS	WHY USED
Lubricants	Certain oils, graphite powder and soaps	To reduce downhole friction
Flocculants	Salt, hydrated lime, gypsum and sodium tetraphosphates	To increase gel strength. Causes some solids to settle out
Filtrate Reducers	Bentonite clays, sodium carboxy-methyl cellulose (CMC) and pregelatinized starch	Reduce filter loss. Prevent "water loss" to porous formations
Foaming Agents	Anionic foaming chemicals	Causes formation water to foam helping gas or air drilling to continue
Restore Circulation	Asphalt emulsions, asbestos fibers, shredded plastics mica flakes, nut hulls, cedar fibers, cottonseed hulls and many other materials	To stop mud loss to porous zones
Shale Control Inhibitors	Gypsum, sodium silicate, chrome lignosulfates, lime and salt	To stop or prevent swelling of shales or clays
Surface Active Agents	Surfactant chemicals	To permit better mixing. Example: water and oil
Thinners and Dispersants	Quebracho, some polyphosphates and lignitic materials	To prevent too high a viscosity, improve pumpability, provide better solids distribution in muds

FUNCTION	MATERIALS	WHY USED
Viscosifiers	Bentonite, CMC, attapaulgite clays and asbestos fibers	To increase viscosity for cuttings removal and gel strength
Preservatives	Formaldehyde	Prevent starch mud from fermenting
Cement Decontamination	Sodium bicarbonate	Prevents mud destruction
Calcium Removers	Caustic soda, soda ash, certain polyphosphates (SAPP) and sodium bicarbonate	To prevent mud destruction by gypsum or anhydrite
Weight Materials	Barite, lead compounds, iron oxides and high specific gravity compounds	To increase mud weight (pounds per gallon) to hold formation fluids in place and prevent hole caving
Corrosion Inhibitors	Hydrated lime, amine salts and dichromate salts	To prevent corrosion of drilling equipment and casing
Oil Emulsion	Special emulsifiers or soaps	To make oil-in-water or water-in-oil emulsions for "oil base" mud

Sources:

American Association of Oilwell Drilling Contractors. Toolpusher's Manual. Section O. September 1970.

Gatlin, Carl. "Drilling and Well Completions." In Petroleum Engineering. Chapter 6. Prentice-Hall, Inc. New York. 1960.

APPENDIX E

STATE OF WASHINGTON
DEPARTMENT OF NATURAL RESOURCES
BRIAN J. BOYLE, Commissioner of Public Lands

OIL AND GAS LEASE INSPECTION REPORT

Date 4-13-84

Applicant's Name SEATTLE DE BOLT ASSOCIATES Application No. 85585

The following items pertain to the area to be leased:

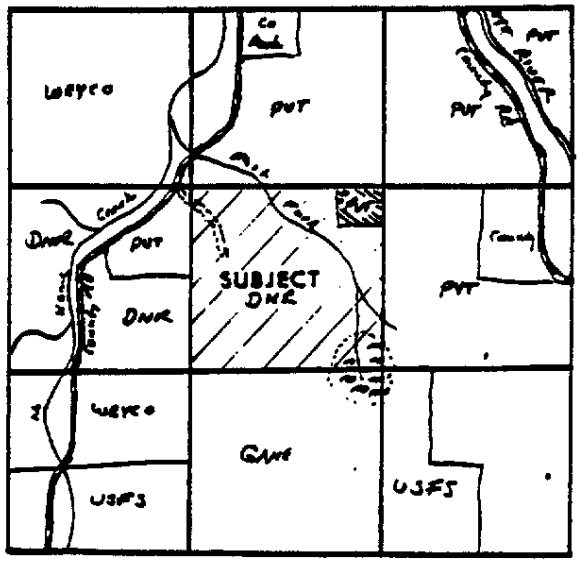
1. Surface Ownership: State [X] Deeded [ ] Both [X]
   NE¼ NE¼ TIMBER RIGHTS DEEDED TO [illegible] DAM
   (Name of surface owner if other than state)
2. Current Use Forestry
3. Ground Cover Second growth timber
4. Topography Gentle to moderate
5. Access: State [X] Private [ ] Other [ ]
   COUNTY and DNR ROADS
   (Explain)
6. Zoning FORESTRY AND AGRICULTURE
   (Obtain from current County Comprehensive Plan)
   COUNTY REQUIRES ROAD PERMIT FOR HEAVY EQUIPMENT
7. Archeological/[illegible]? [illegible]angered plants/animals? Yes [X] No [ ]
8. Other Information TYPE 2,3,4,5 [illegible] in area
   TYPE 4,5 WATERS on DNR land
   93-001787 PLANT [illegible] 002286 SPECIAL ANIMAL
   OF=COTTONWOOD RESOURCE AREA

Sec. 16 Township 18 [illegible] 3E, W.M. THURSTON County

Scale: [illegible]" = 4,000 feet

On the plat, indicate the location of the following on the property and within one mile radius of property:

1. Surface ownership, if ownership other than state.
2. Adjacent surface ownership.
3. Incorporated areas.
4. Municipal watersheds.
5. Natural Area Preserves, endangered species, plant and animals.
6. Rivers, lakes, wetlands and other natural features.
7. Residences and other buildings.
8. Ground cover.
9. Game Department Lands.
10. State parks and other parks.
11. Any other significant features.



DNR - FEE SIMPLE
DNR - OIL AND MINERAL RIGHTS ONLY
WETLANDS - [illegible]

RES 30-1820 (12-82)

((PROGRAM)) POLICY IMPACT ANALYSIS INDEX

POLICIES WITH IMPACTS ON THE ENVIRONMENT	ELEMENTS OF THE ENVIRONMENT								
	Earth	Air	Water	Plants & Animals	Energy & Nat. Res.	Env. Health	Land Use	Transp.	Pub. Serv. & Utilities
Plants & Animals	39	39	39	39	40	40	40	40	40
Nat. Areas & Registry	40	40	40	40	41	41	41	41	41
Cultural Resources	41	41	41	41	41	42	42	42	42
Road Construction	43	43	43	44	44	44	44	45	45
Gravity Surveys	51	51	51	51	51	51	51	51	51
Magnetotelluric	52	52	52	52		54	54	54	54
Time-Domain Sound.	54	54	54	54	54	54	54	54	54
Geochemical Sampling	55	55	55	55	55	55	55	55	55
Vibratory Surveys	58	58	58	58	60	60	60	60	60
Shot Hole Seismic	62	63	63	63	64	64	65	65	65
Air Shot Seismic	66	66	67	67	67	67	68	68	68
Stratigraphic Drill.	70	70	70	72	72	72	72	73	73
Drill Pad Construction & Rig Ass'y.	75	75	76	76	76	76	78	78	79
Exploratory Drilling	79	79	80	81	81	82	83	84	84